

Somerville, New Jersey, 10th.
 Frankfort, Kentucky, 14th.
 Bristol, New Hampshire, 24th.
 Yates Centre, Kansas, 27th.
 Blooming Grove, Pennsylvania, 30th.
 Embarrass, Wisconsin, 30th.
 Highlands, North Carolina, 31st.
 Milan, Tennessee, 31st.

WINDS.

The most frequent directions of the wind during January, 1884, at the Signal Service stations are shown on chart iii. by arrows flying with the wind. In the lake region and New England they were from south to west; on the Atlantic coast south of Massachusetts they were variable, between north and south through west; on the immediate Gulf coast they were northerly; in the Ohio valley, from south to west; in Tennessee and the northern parts of Georgia and Alabama, from west to northwest; in the extreme northwest, upper Mississippi and Missouri valleys, and over the eastern slope of the Rocky mountains they were variable, between north and south through west; on the Pacific coast they were generally from northeast to southeast.

TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Block Island, R. I.....	14,115	New Haven, Conn.....	6,309
Middle Atlantic states.....	Sandy Hook, N. J.....	15,215	Lynchburg, Va.....	2,763
South Atlantic states.....	Fort Macon, N. C.....	12,271	Augusta, Ga.....	2,893
Florida peninsula.....	Key West.....	9,343	Sanford.....	5,972
Eastern Gulf states.....	New Orleans, La.....	6,817	Montgomery, Ala.....	3,891
Western Gulf states.....	Indianola, Tex.....	11,715	Little Rock, Ark.....	4,035
Ohio valley.....	Louisville, Ky.....	6,971	Cincinnati, Ohio.....	4,542
Tennessee.....	Nashville.....	5,320	Knoxville.....	4,989
Lower lake region.....	Buffalo, N. Y.....	12,324*	Toledo, Ohio.....	6,232
Upper lake region.....	Milwaukee, Wis.....	10,685	Duluth, Minn.....	5,342
Extreme northwest.....	Moorhead, Minn.....	7,413	Bismarck, Dak.....	5,441
Upper Mississippi valley.....	Saint Louis, Mo.....	10,686	Saint Paul, Minn.....	4,253
Missouri valley.....	Huron, Dak.....	7,379	Fort Bennett, Dak.....	4,526
Northern slope.....	Cheyenne, Wyo.....	10,751	Helena, Mont.....	2,850
Middle slope.....	Fort Elliott, Tex.....	9,713	West Las Animas, Colo.....	5,650
Southern slope.....	Fort Concho, Tex.....	7,183	Fort Davis, Tex.....	4,408
Southern plateau.....	Fort Grant, Ariz.....	5,395	El Paso, Tex.....	2,823
Northern plateau.....	Dayton, Wash. T.....	3,001	Lewiston, Idaho.....	826
North Pacific coast region.....	Fort Canby, Wash. T.....	11,562	Roseburg, Oreg.....	2,017
Middle Pacific coast region.....	Cape Mendocino, Cal.....	12,477†	Sacramento, Cal.....	4,279
South Pacific coast region.....	Los Angeles, Cal.....	5,166	San Diego, Cal.....	4,343

* Record incomplete; about 35 miles lost during gale of the 3d. † Record for twenty-three days only.

HIGH WINDS.

On the summit of Mount Washington velocities of fifty miles or more per hour occurred on the following dates: 2d to 18th, 21st to 24th, 26th, 27th, 30th, 31st. The highest velocities recorded were: 90, nw., 3d; 108, nw., 4th; 104, nw., 5th; 80, nw., 6th; 112, se., 9th; 130, nw., 10th (maximum for the month); 84, nw., 21st; 88, nw., 22d; 80, nw., 27th; 116, sw., 30th; 88, w. and nw., 31st.

On the summit of Pike's Peak, velocities of fifty miles or more per hour occurred on the following dates: 1st to 6th, 8th, 9th, 19th, 22d, 26th to 29th, 31st. The highest velocities recorded were: 72, nw., 5th; 72, sw., 29th; 76, w., 31st (maximum for the month).

At Cape Mendocino, California, the highest velocities were: 64, se., 2d; 52, se., 3d; 100, se., 4th and 5th; 68, se., 6th; 100, se., 26th.

Other stations reporting wind-velocities of fifty miles or more per hour are as follows:

Fort Canby, Washington Territory, 52, se., 4th; 72, se., 5th; 64, s., 6th.

Barnegat City, New Jersey, 68, e., 9th.
 Fort Macon, North Carolina, 68, se., 8th; 56, sw., 9th.
 Kitty Hawk, North Carolina, 60, ne., 5th; 64, ne., 8th.
 Buffalo, New York, 51, w., 2d; 59, w., 3d.

Sandy Hook, New Jersey, 56, w., 2d; 50, e., 8th and 9th; 52, w., 10th.

Cape May, New Jersey, 56, nw., 2d; 50, e., 8th; 52, w., 9th.
 Portland, Maine, 56, se., 9th.

Indianola, Texas, 54, n., 1st.
 Provincetown, Massachusetts, 53, se., 9th.
 Delaware Breakwater, Delaware, 52, w., 13th
 Fort Maginnis, Montana, 52, sw., 11th.
 Cape Henry, Virginia, 50, se., 8th.

LOCAL STORMS.

Buffalo, New York.—A severe gale prevailed on the 3d, during which the wind reached a maximum velocity of 59 miles from the west at 2.10 p. m. At 6.40 p. m. the anemometer cups were blown away. This storm occurred after the passage of low areas numbers i. and ii.

Cape Mendocino, California.—A violent storm occurred on the 4th. For fifteen minutes the wind blew at the rate of 100 miles per hour, and at times it reached a velocity of 120 miles for shorter intervals. The anemometer cups were blown away at 8.05 p. m. The fence around the station was also blown away, and the wood stored in the yard was scattered over the reservation. The storm continued during the 5th; at 10.15 a. m. the arms of the anemometer were broken off by the violence of the wind. This storm, occurring in connection with low area iv., is considered to have been one of the severest ever experienced there. On the 26th the wind suddenly veered to southeast during the early morning and increased in force until noon, when a wind-velocity of 100 miles was recorded; a few minutes later the anemometer was again blown away. The maximum hourly velocity of the wind is estimated at 125 miles. The storm continued without abatement until 3.30 p. m., when the wind moderated to about 50 miles per hour. No serious damage resulted from the storm, other than the cutting off of telegraphic communication. It occurred during the existence of low area xvi.

Narragansett Pier, Rhode Island.—During a brisk westerly gale on the 4th (succeeding low area ii.) the schooner "Adriane" was driven ashore on Block Island.

San Francisco, California.—A maximum wind-velocity of 28 miles se., occurred on the 5th. At Point Lobos the wind attained a velocity of 68, se., at 12.15 p. m., when the anemometer cups were blown away. The water in San Francisco bay was very rough, causing some of the vessels to drag anchor. Considerable damage was done at Oakland by the high wind. This storm occurred during the passage of low area number iv.

Galveston, Texas.—During a "norther" on the 7th (low area iv.) the bark "Norma" went ashore a few miles west of this city, and the steamer "Aransas" was driven by a high wind into the bend of the channel, where she was grounded.

Mobile, Alabama.—Reports from Fort Morgan, Alabama, state that between 5.30 and 6.30 p. m. of the 5th, the northerly wind attained a velocity of 49 miles per hour, causing the ship "Halliope" to drag anchor, and resulting in other damage to shipping interests.

Barnegat City, New Jersey.—A very severe storm prevailed during the early morning of the 9th, (low area iv.) the wind reaching a velocity of 68 miles per hour, and for five minutes a velocity of 84 miles was recorded. The barkentine "Elmina" was driven ashore north of Beach Haven on the 8th; she began going to pieces at 10 p. m., and by 3 a. m. of the 9th she was a total wreck. All on board were lost; the number of persons is supposed to have been about ten.

Point Judith, Rhode Island.—The storm of the 9th (low area iv.) was very severe during the early morning; the highest velocity of the wind, 65 miles, occurred at 3 a. m.

Provincetown, Massachusetts.—A severe gale occurred on the 9th (low area iv.), the wind reaching a velocity of 53 miles se. Some slight damage was sustained by vessels in the harbor.

Thatcher's Island, Massachusetts.—A violent southeasterly gale occurred on the 9th (low area iv.). It reached its height

at 4.55 p. m., when a maximum velocity of 50 miles per hour was recorded. No damage resulted from the storm in this vicinity.

Portland, Maine.—A violent gale occurred on the 9th (low area iv.). A wind-velocity of 56 miles se. was recorded at 8.30 a. m., and for five minutes the wind blew at the rate of 60 miles per hour. The schooner "Etna" was foundered off Portland Head Light, and three fishing schooners were driven ashore on Cape Elizabeth.

Eastport, Maine.—A gale occurred on the 9th lasting from 9.25 a. m. until 4.15 p. m. (low area iv.), during which a maximum wind-velocity of forty-six miles se. occurred.

Troy, New York.—A violent storm swept over Rensselaer county between 1 and 4 a. m. of the 9th (low area iv.) Its track was about four miles in width. In the town of Poesten-kill every house was damaged; chimneys were blown down and barns moved from their foundations.

SAND STORMS.

Arizona.—Maricopa, 10th, 11th; San Carlos and Willcox, 11th; Fort McDowell, 20th; Yuma, 23d.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The highest stage in the Ohio river was noted at Cincinnati, Ohio, and Louisville, Kentucky, on the 1st, and at Pittsburg, Pennsylvania, on the 2d.

The Missouri river continued frozen at Leavenworth, Kansas, and at all points northward, throughout the month.

The Mississippi remained frozen during the month at Keokuk, Iowa, and points above.

The Arkansas river was frozen at Fort Smith, Arkansas, on the 7th, 8th, 9th, and 12th; and at Little Rock, Arkansas, from the 7th to 13th.

In the following table are shown the danger-points at the various river stations; the highest and lowest stages for January, 1884, with the dates of occurrence; and the monthly ranges:

Heights of rivers above low-water mark, January, 1884.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.	
		Date.	Height.	Date.	Height.	Ft.	In.
<i>Red River:</i>							
Shreveport, Louisiana.....	29 9	1	13 5	31	10 2	3	3
<i>Arkansas:</i>							
Little Rock, Arkansas.....	33 0	1	5 10	29, 30	3 10	2	0
Fort Smith, Arkansas.....		6	— 1 7 $\frac{1}{2}$	25	— 3 6 $\frac{1}{2}$	1	11
<i>Missouri:</i>							
Yankton, Dakota †.....	20 0						
Omaha, Nebraska.....	16 0						
Leavenworth, Kansas.....	21 0						
<i>Mississippi:</i>							
Saint Paul, Minnesota †.....	14 6						
La Crosse, Wisconsin †.....	18 0						
Dubuque, Iowa †.....	21 10						
Davenport, Iowa †.....	15 0						
Keokuk, Iowa †.....	14 6						
Saint Louis, Missouri.....	30 0	18	12 4	4	3 4	9	0
Cairo, Illinois.....	40 0	3	35 3	16	23 2	12	1
Memphis, Tennessee.....	34 0	5	20 9	18	17 7	9	2
Vicksburg, Mississippi.....	41 0	11, 12	35 2	1	23 11	12	3
New Orleans, Louisiana *.....	— 2 6	20	— 3 9	1	— 10 6	6	9
<i>Ohio:</i>							
Pittsburg, Pennsylvania.....	20 0	2	17 2	24, 26, 28, 29	3 2	14	0
Cincinnati, Ohio.....	50 0	1	38 11	13	15 5	23	6
Louisville, Kentucky.....	24 0	1	19 10	13	7 0	12	10
<i>Cumberland:</i>							
Nashville, Tennessee.....	42 0	17	31 11	10	9 4	22	7
<i>Tennessee:</i>							
Chatanooga, Tennessee.....	33 0	21	14 10	10	3 5	11	5
Knoxville, Tennessee.....	20 0	20	6 4	8	1 7	4	9
<i>Monongahela:</i>							
Pittsburg, Pennsylvania.....	29 0	2	17 2	24, 26, 28, 29	3 2	14	0
<i>Savannah:</i>							
Augusta, Georgia.....	20	22	8	10	5 0	17	8
<i>Willamette:</i>							
Portland, Oregon.....	10	8	10	24	0 8	8	2
<i>Sacramento:</i>							
Red Bluff, California.....	6	6	0	3, 4, 5	0 10	5	2
Sacramento, California.....	31	13	6	5, 23, 24, 25	7 10	5	8
<i>Mobile:</i>							
Mobile, Alabama.....	18	15	8	3	12 0	3	8
<i>Colorado:</i>							
Yuma, Arizona.....	2, 3	16	8	17, 18	14 4	2	4

* Below high-water mark of 1874 and 1883. † Frozen throughout the month. ‡ Frozen part of month; see text. § below bench-mark.

ICE IN RIVERS AND HARBORS.

Saint Croix river.—Calais, Maine: the river closed to navigation during the night of the 15–16th.

Narragansett bay.—Narragansett Pier, Rhode Island: large fields of ice passed out of the bay on the 20th. At 4 a. m. an ice-field, fully three miles in length, passed this station; ice continued to pass until the afternoon of the 21st.

Block Island, Rhode Island: the harbor froze on the 6th.

Broad lake.—Burlington, Vermont: the lake froze over on the 9th, which is the earliest closing of the last ten years.

Lake Champlain.—Charlotte, Vermont: the lake began to freeze on the 8th; on the 10th, it was firmly frozen.

New Haven harbor.—New Haven, Connecticut: the harbor froze on the 6th, but the ice was broken up by the storm of the 9th; some of the vessels sustained damage in consequence.

Housatonic river.—Bethel, Fairfield county, Connecticut: the ice broke up in the river on the morning of the 9th.

New York harbor.—New York City: the flood tide on the morning of the 13th brought up from the harbor an immense floe of ice which blockaded East river from shore to shore. At 6.30 a. m. the end of pier 27 was carried away and a two-masted schooner and a lighter on the north side of the pier were sunk. The damage to the pier is estimated at \$3,000. Navigation was interrupted for several hours during the morning. On the 22d navigation was interrupted by ice-fields in the upper harbor. All sailing vessels passing through the narrows on that date were compelled to employ tugs.

David's Island: persons crossed on the ice to the mainland on the 27th.

Barnegat bay.—Barnegat City, New Jersey: the bay closed by ice on the 7th, cutting off communication with the mainland. It remained frozen until broken up by the storm of the 9th. It froze over again on the evening of the 20th.

Little Egg harbor.—Little Egg harbor, New Jersey: large quantities of ice in the harbor on the 9th.

Hudson river.—New York City: considerable floating ice on the 12th.

Delaware river.—Philadelphia, Pennsylvania: from Trenton, New Jersey, to Port Richmond, the ice was sufficiently strong to permit the crossing of teams on the 8th. The river below Philadelphia was frozen nearly across for the first time in several years.

Delaware bay.—Delaware Breakwater, Delaware: the harbor was filled with ice on the 7th.

Chincoteague bay.—Chincoteague, Virginia: the bay froze over on the 6th, but the ice broke up on the afternoon of the 8th. Ice formed rapidly on the bay on the 21st.

Chesapeake bay.—Baltimore, Maryland: brisk southeast to northeast winds on the 8th drove large quantities of ice from the bay into the river and harbor, causing much inconvenience to vessels. Large quantities of ice were driven into the track of vessels on the west shore. The large amount of ice in the bay on the 9th rendered navigation very difficult. Many oyster boats were ice-bound and much suffering was experienced by their crews.

Severn river.—Annapolis, Maryland: the northeast wind on the night of the 8–9th cleared Annapolis harbor of ice and opened navigation.

Patapsco river.—Baltimore, Maryland: ice formed rapidly in the harbor on the 6th, and on the 7th it varied from two to three inches in thickness. Large quantities of ice were driven into the harbor and river by the strong easterly winds on the 28th, rendering navigation difficult.

Potomac river.—Washington City, District of Columbia: river frozen over on the 1st; ice strong enough for skating from about the 7th to 27th; the ice was softened considerably by the increasing temperature on the 30th. The ferry steamer "City of Alexandria" made her way through the ice to Alexandria, Virginia, on this date. On the 31st the channel was clear as far as Georgetown, District of Columbia; above this point the ice remained unbroken on the 31st.

Choptank river.—Oxford, Maryland: a breaking of the ice